

JOHN WILEY & SONS, Inc.

605 Third Avenue

New York, N. Y. 10016

BULK RATE
U. S. POSTAGE
PAID
New York, N. Y.
Permit No. 1244

12601
POUGHKEEPSIE
NEW YORK
LIBRARY
UNIVERSITY
OF THE
STATE OF
NEW YORK
ALBANY
12601

Wiley presents the most recent

Information

*for all
progress-oriented
users...
designers...
and students of
information
systems & services*

on information

**from COSATI...American Documentation Institute...System
Development Corporation...and National Science Foundation**

The results of the COSATI-sponsored study on national information systems relating to scientific and technical documents—presented in a clear and well-organized manner.

National Document-Handling Systems for Science and Technology

By LAUNOR F. CARTER, GORDON CANTLEY, JOHN T. ROWELL, LOUISE SCHULTZ, HERBERT R. SEIDEN, EVERETT WALLACE, RICHARD WATSON, and RONALD E. WYLLYS, all of the System Development Corporation, Santa Monica, California.

“This book has grown out of a study undertaken for the Committee on Scientific and Technical Information (COSATI) Task Group on National System(s) for Scientific and Technical Information in support of their examination of national document and information systems. The emphasis of the study as stated by COSATI is the following:

“ ‘1. Initial and primary priority will be placed on national systems relating to scientific and technical documents, their handling and the management of such documents. . . .

“ ‘2. Secondary attention will be given to development of programs which can be undertaken with Government support for identifying, analyzing and giving a structure to the total flow of scientific and technical information in the United States.’ ”

From the Preface.

The System Development Corporation group that participated in this study collected information from reports of former study groups, published studies of user needs for scientific and technical information, and from observations of the scientific and technical information system as it is presently functioning in public and private institutions.

National Document-Handling Systems for Science and Technology contains all the ideas presented in the original COSATI report—expanded and clarified by the people initially responsible for them—in a format and order that has been extensively revised to make the book more informative and readable.

 This is the kind of information you'll find in this book

A complete study of information-handling organizations and systems as they operate in the United States today

A survey of the degree to which the output of the scientific and technical community is decreased by the deficiencies in these organizations and systems

A wealth of useful details about available and economically feasible systems that would correct these deficiencies

Five action plans for the future—drawn up by the COSATI experts—for use by governmental and private institutions

CONTENTS:

Introduction

Description of the Present System

The Present System: Document-Handling Institutions. The Present System: Document Flow. Document Users.

The Problem and Basic Propositions

The National Document-Handling Problem. Basic Propositions and System Requirements.

Alternative Approaches to the Problem

Selected Plans for National Document Systems. The Capping Agency and Responsible Agent Concepts. The Concept of New Operating Agencies. The Concept of Strengthening the Present System.

An Evaluation and Prognosis

An Evaluation of Alternatives. Present Status and Future Programs.

Appendices

Advanced Information Systems, Equipment and Software. Statistical Review. Review of Federal Legislation and Executive Orders.
Index. 1967. 344 pages. \$9.95.

A publication in the Wiley Information Science series.

A complete annual review—sponsored by the American Documentation Institute.

Annual Review of Information Science and Technology

Edited by CARLOS A. CUADRA, *System Development Corporation.*

In 1964, the National Science Foundation joined the System Development Corporation in lending major support to the initiation of an annual review series to be concerned with information science and technology. The American Documentation Institute accepted sponsorship of the reviews and appointed an editor and an advisory committee early in 1965.

The series is intended to be of tangible benefit to individuals, public and private organizations, universities, and government agencies. Although the field cuts across numerous disciplines, the people involved in it all share a concern with the generation, transformation, communication, storage, retrieval, and use of information. This volume and the ones which will follow it, are planned as constructive reviews of topics of interest to users, designers and students of information systems and services. By providing a perspective on the information field, such reviews not only point out gaps and duplications but also serve as sources of new ideas. The *Annual Review* will attempt to reflect current interests, and, by including information on the field from a number of related disciplines, to broaden and deepen them.

The present volume covers, for the most part, literature that appeared in 1965. Some of the earlier literature is also reviewed because this volume, as the first in the series, had no prior context to serve as a frame of reference. Volume II, which will appear in the fall of 1967, will cover 1966 literature.

CONTENTS and AUTHORS:

Introduction to the ADI Annual Review—Carlos A. Cuadra. Professional Aspects of Information Science and Technology—Robert S. Taylor. Information Needs and Uses in Science and Technology—Herbert Menzel. Content Analysis, Specification and Control—Phyllis Baxendale. File Organization and Search Techniques—W. Douglas Climenson. Automated Language Processing—Robert F. Simmons. Evaluation of Indexing Systems—Charles P. Bourne. New Hardware Developments—Annual Review Staff. Man-Machine Communication—Ruth M. Davis. Information System Applications—Jordan J. Baruch. Library Automation—Donald V. Black and Earl Farley. Information Centers and Services—G. S. Simpson, Jr. and Carolyn Flanagan. National Information Issues and Trends—John Sherrod. Index—Pauline Atherton and Stella Keenan.

1966. 389 pages. \$12.50.

An Interscience book

Typeset and indexed by computer—a book that shows how to use computers to process natural language in order to facilitate the communication, production, translation, storage and retrieval of information.

Automated Language Processing The State of the Art

Edited by HAROLD BORKO, *System Development Corporation.*

In the light of simultaneously increasing knowledge and specialization—especially in science and technology—the increased efficiency of information flow has come to be of primary importance. In the age of automation this can be successfully accomplished only by automated means—language processing by computer. The objective of this book is—by presenting basic information on the procedures and purposes of processing natural language data by computer—to identify and define the problems which remain to be solved if the system is to be completely adequate.

In the first section, functions basic to language processing are related to computer processing systems, and the applications of mathematical models to language and linguistics are examined. The applications of statistical processing techniques to indexing, abstracting and analysis of style are considered in the second part. Finally, syntactic analysis techniques and their use in computer question answering, translation, and information retrieval are discussed.

The book itself is an experiment in language data processing: it has been typeset and indexed by computer.

Each chapter has been written expressly for this book by a recognized leader in his field.

CONTENTS and AUTHORS:

Language Data Processing

Introduction—Harold Borko. Language and the Computer—Louise Shultz. Mathematical Models of Language—H. P. Edmundson.

Statistical Analysis

Indexing and Classification—Harold Borko. Extracting and Abstracting by Computer—Ronald E. Wyllys. Stylistic Analysis—Sally and Walter Sedelow.

Syntactic Analysis

Theories in Computer Implementations—D. G. Bobrow. Answering English Questions by Computer—R. F. Simmons. Translating Languages—E. D. Pendergraft. Designing Artificial Languages for Information Storage and Retrieval—C. Kellogg.

1967. Approx. 480 pages. Prob. \$12.95.

Order from your bookseller—or order direct from Wiley by asking for F08950 Borko: Language.

A publication in the Wiley Information Science series.

... the most up-to-date review of mechanized information retrieval ...
—JOHN MARKUS, McGraw Hill Book Company, in *Proceedings of the IEEE*.

Now available in a new edition

Textbook on Mechanized Information Retrieval

By ALLEN KENT, Knowledge Availability Systems Center and the University of Pittsburgh.

CONTENTS:

Introduction. Physical Tools—Introduction. Physical Tools—Input Operations. Physical Tools—Output Operations. Principles of Analysis. Principles of Searching. Manipulation of Searching Devices. Words, Language, and Meaning in Retrieval Systems. Codes and Notations. Systems Design Criteria. Data Processing and the Library. Research on Scientific Documentation and Information Retrieval. Appendix. Author Index. Subject Index.

1966. 371 pages. \$10.95.

Volume 3 in the INTERSCIENCE Library Science and Documentation series.

The Analysis of Information Systems

A Programmer's Introduction to Information Retrieval

By CHARLES T. MEADOW, International Business Machines Corporation.

Deals with the problems and methods of using a computer to store, search and retrieve information—for those involved in the analysis, design or use of information systems.

CONTENTS:

Information Retrieval and Communication:

Introduction. The Languages of Information Retrieval. The Creation of Index Records. Retrieval of Index Records.

The Organization of Information:

The Organization of Records. The Organization of Files. The Storage and Measurement of Structural Information. The Organization of File Sets.

Processing of Files and File Sets:

Basic File Processes. File Maintenance. 1967. 301 pages. \$11.50.

A publication in the Wiley Information Science series.

Information Theory

By ROBERT ASH, University of Illinois.

"My opinion is that it is the best textbook so far available on this subject at this level. I am pleased that he manages to be mathematically correct as well as interesting." Professor Leo Breiman, University of California.

CONTENTS:

A Measure of Information. Noiseless Coding. The Discrete Memoryless Channel. Error Correcting Codes. Further Theory of Error Correcting Codes. Information Sources. Channels with Memory. Continuous Channels. Appendices: Compact and Symmetric Operators on $L_2[a,b]$. Integral Operators. The Karhunen-Loève Theorem. Further Results Concerning Integral Operators Determined by a Covariance Function. 1965. 339 pages. \$13.50.

INTERSCIENCE Tracts in Pure and Applied Mathematics, Volume 19.

"... the most useful book in English on the subject ..."

College and Research Libraries

Information Storage and Retrieval: Tools, Elements, Theories

By JOSEPH BECKER, Data Processing and Library Consultant, and ROBERT M. HAYES, University of California, Los Angeles.

CONTENTS:

TOOLS: Introduction. The Librarian and Recorded Knowledge. The Documentalist and the Development of New Techniques. The Information Framework and the User. Printed Data and the Creation of a Machine Language. Analysis, Logical Processing and the Computer. Indexes, Documents, and the Storage of Data.

ELEMENTS: Interdisciplinary Character of Information Systems. Elements of Usage. Elements of Organization. Elements of Equipment. Parameters and Implementation.

THEORIES: Role of a Theory. Theories of File Organization. Theories of System Design. 1963. 448 pages. \$11.95.

A publication in the Wiley Information Science Series.



JOHN WILEY & SONS, Inc.
605 Third Avenue, New York, N.Y. 10016

Please send the books I have checked on ten days' approval. I agree to pay for the books, plus a few cents for shipping charges, or return them postpaid, in good condition, within ten days of receipt. (Wiley pays postage on orders accompanied by remittance.)

- | | |
|--|--|
| ☐ F 13731 Carter: National Document | ☐ I 03445 Ash: Information |
| ☐ I 18919 Cuadra: Information, Vol. 1 | ☐ F 06129 Becker: Information |
| ☐ F 08950 Borko: Language | ☐ F 09150 Bourne: Information |
| ☐ I 46935 Kent: Textbook, 2nd Ed. | ☐ I 83310 Strauss: Libraries |
| ☐ F 59000 Meadow: Information | |

Send to:

Firm _____

Name _____

Address _____

City _____ State _____ Z.C. _____

☐ Payment Enclosed

Methods of Information Handling

By CHARLES P. BOURNE, *Advanced Information Systems Division, Programming Services, Incorporated.*

"Bourne aims at providing 'an aid and reference work for those people who are interested in the design of information systems.' The aim is amply fulfilled, and the work is highly recommended. . . . It shows a broad and eclectic knowledge of the literature."

American Documentation.

CONTENTS:

The Nature of the Problem. Classification and Indexing: The Organization of Information. Coding: The Indexing Shorthand. Machine-Language Representation. Manual Card Systems. Punched Card Systems. Computer Systems. Other Paper-Tape and Magnetic Media Equipment. Microfilm and Image Handling Equipment.

1963. 241 pages. \$12.95

A publication in the Wiley Information Science Series.

Also available

Scientific and Technical Libraries

Their Organization and Administration

By LUCILLE J. STRAUSS, IRENE M. STRIBY, and ALBERT L. BROWN.

"... the kind of reference the wise technical library administrator will keep on the shelf as required reading ..."

Special Libraries

1964. 398 pages. \$8.50.

A volume in the INTERSCIENCE Library Science and Documentation series.

0751



Business Reply Card

FIRST CLASS PERMIT NO. 32664, NEW YORK, N. Y.

JOHN WILEY & SONS, Inc.

605 Third Avenue

New York, N.Y. 10016

Attention: I. Rosen



FILE MAINTENANCE

Introduction
File Maintenance Principles
Examples of File Maintenance Processing
Summary

The Information Sciences Series

NETWORK-BASED MANAGEMENT SYSTEMS (PERT/CPM)

By RUSSELL D. ARCHIBALD, *Informatics, Inc.*, and RICHARD VILLORIA, *Houston-Fearless Corporation*.

1967. 508 pages. \$16.00.

INFORMATION STORAGE AND RETRIEVAL

By JOSEPH BECKER, *Interuniversity Communications Council (EDUCOM)*, and ROBERT M. HAYES, *University of California, Los Angeles*.

1963. 448 pages. \$11.95.

AUTOMATED LANGUAGE PROCESSING

By HAROLD BORKO, *System Development Corporation*.

1967. Approx. 480 pages. Prob. \$12.95.

METHODS OF INFORMATION HANDLING

By CHARLES P. BOURNE, *Programming Services Inc.*

1963. 241 pages. \$12.95.

NATIONAL DOCUMENT-HANDLING SYSTEMS FOR SCIENCE AND TECHNOLOGY

By LAUNOR F. CARTER, *System Development Corporation*.

1967. 344 pages. \$9.95.

MATHEMATICS OF INFORMATION SYSTEMS

By ROBERT M. HAYES, *University of California, Los Angeles*.

In preparation.

THE ANALYSIS OF INFORMATION SYSTEMS:

A Programmer's Introduction to
Information Retrieval

By CHARLES T. MEADOW, *IBM Corporation*.

1967. 301 pages. \$11.50.



John Wiley & Sons, Inc.

605 Third Avenue
New York, N. Y. 10016

The Information Sciences Series

Edited by ROBERT M. HAYES, *University of California at Los Angeles*, and JOSEPH BECKER, *Interuniversity Communications Council (EDUCOM)*; Consultants: CHARLES P. BOURNE, *Director, Advanced Information Systems Division Programming Services, Inc.*, and HAROLD BORKO, *System Development Corporation*.



This series covers a broad spectrum of topics dealing with the storage and use of digital and graphic information, including: information system theory and design . . . man-machine relationships . . . language data processing . . . artificial intelligence . . . mechanization of library processes . . . non-numerical application of digital computers . . . automatic publishing . . . and information display.

ANNOUNCING

*the latest volume in
this continuing series —*

The Analysis of Information Systems

**A Programmer's Introduction to
Information Retrieval**

CHARLES T. MEADOW

Federal Systems Division

International Business Machines Corporation

The Analysis of Information Systems A Programmer's Introduction to Information Retrieval

By CHARLES T. MEADOW, *Federal Systems Division, IBM Corporation.*

Information retrieval languages, the organization of records and files, and the processing of files all have important effects on the performance and economics of retrieval systems. This book provides a careful treatment of the problems associated with these three aspects of using a computer to store and retrieve information.

Approaching information retrieval as a communication activity between system user, library, and author, the book deals first with the available languages — including the language of the document, the library's description of that document in diverse classification and indexing languages, and the use of language to query information files.

Types of record and file structure are then considered with regard to their ability to represent the languages and their advantages and disadvantages in file searching. Finally, the book presents techniques for performing the standard file processing functions of sorting, merging, and file maintenance.

1967.

301 pages.

\$11.50.

Contents

Part I — INFORMATION RETRIEVAL AND COMMUNICATION

INTRODUCTION

Information Retrieval as a Communication Process
The Information Retrieval Process

THE LANGUAGES OF INFORMATION RETRIEVAL

Introduction
Attributes of Index Languages
A Survey of Index Languages
The Logic of Indexing Languages
A Comparative Analysis of Index Languages
Dictionaries

THE CREATION OF INDEX RECORDS

Information
Principles of Index Construction
Use of Document Structure in Indexing
Statistical Selection of Index Terms

RETRIEVAL OF INDEX RECORDS

Introduction
Principles of Retrieval
Retrieval Planning
Retrieval System Performance
Use of Retrieval Information

Part II — THE ORGANIZATION OF INFORMATION

THE ORGANIZATION OF RECORDS

Introduction
Principles of Record Organization
The Progression of Record Structures
Summary

THE ORGANIZATION OF FILES

Introduction
File Processing and Searching
The Role of Storage Media in File Organization
Principles of File Organization
Methods of File Organization

THE STORAGE AND MEASUREMENT OF STRUCTURAL INFORMATION

Introduction
Concepts of Information Theory
Representation of File Structure Information
Measurement of File Structure Information

THE ORGANIZATION OF FILE SETS

Introduction
Principles of File Set Organization
Fixed Sequence File Searching
The Inverted Index File
Variable Sequence Searching

Part III — PROCESSING OF FILES AND FILE SETS

BASIC FILE PROCESSES

Introduction
File Sequence
Merging
Sorting
Searching
Batch Processing

(Continued overleaf)

*New methods, new understanding of old methods, new equipment,
and new computer languages have led to the preparation of*

MATHEMATICAL METHODS for DIGITAL COMPUTERS

VOLUME 2

Edited by ANTHONY RALSTON, *Professor of Mathematics and Director of
Computing Center, State University of New York at Buffalo; and*
HERBERT S. WILF, *Professor of Mathematics, The University of Pennsylvania.*

Mathematical Methods for Digital Computers, Volume 2, is an entirely new sequel to the popular Volume 1 of the same name—see following page—now a standard reference work on applications of numerical analysis on digital computers.

In this new volume the editors have followed the format of Volume 1. All of the strong points of this first volume have been retained—including the authors' presentation of complete mathematical discussions followed by detailed program flow charts.

All the subject matter in this book is new, however. Gaps left in subjects in the last volume have been filled, and new advances made in the past five years have been added. Most of the new material is treated by outstanding research workers in the field—including Henrici, Traub and Wilkinson.

Outstanding features of this new volume:

- only book in which important problems of numerical analysis are treated in a vertically integrated way—covering all aspects from conception up to actual coding for the machine
- contributions by world-renowned leaders in the field
- written specifically for users of digital computers
- a standardized format in virtually every chapter
- broad coverage in each chapter; from mathematical analysis through calculation procedure, flow chart, sample problem, etc.

Contents

INTRODUCTION

PART I—PROGRAMMING LANGUAGES

An Introduction to FORTRAN and ALGOL Programming—NIKLAUS WIRTH, *Stanford University*

PART II—THE QUOTIENT-DIFFERENCE ALGORITHM

Quotient-Difference Algorithms—PETER HENRICI, *Eidgenössische Technische Hochschule, Zurich*

PART III—NUMERICAL LINEAR ALGEBRA

The Solution of Ill-Conditioned Linear Equations—J. H. WILKINSON, *National Physical Laboratory*

The Givens-Householder Method for Symmetric Matrices—JAMES ORTEGA, *University of Maryland*

The LU and QR Algorithms—B. N. PARLETT, *University of California (Berkeley)*

PART IV—NUMERICAL QUADRATURE AND RELATED TOPICS

Advances in Numerical Quadrature—HERBERT S. WILF, *The University of Pennsylvania*
Approximate Multiple Integration—A. H. STROUD, *State University of New York at Buffalo*

Spline Functions, Interpolation, and Numerical Quadrature—T. N. E. GREVILLE, *University of Wisconsin*

PART V—NUMERICAL SOLUTION OF EQUATIONS

The Solution of Transcendental Equations—J. F. TRAUB, *Bell Telephone Laboratories (Murray Hill)*

The Numerical Solution of Polynomial Equations and the Resultant Procedures—ERWIN H. BAREISS, *Argonne National Laboratory*

Alternating Direction Methods Applied to Heat Conduction Problems—JEROME SPANIER, *Bettis Atomic Power Laboratory*

PART VI—MISCELLANEOUS METHODS

Random Number Generation—JACK MOSHMAN, *EBS Management Consultants*

Rational Chebyshev Approximation—ANTHONY RALSTON, *State University of New York at Buffalo*

1967. 287 pages. \$11.95.

Order from your bookseller—or order direct from Wiley by asking for F 70686 Ralston: *Computers, Vol. 2.*

"... this reviewer is impressed with the authors' efforts to make the book a work of practical value, and the success of those efforts is indicated by the use students have made of it... it is recommended as a useful and convenient reference."—*PHYSICS TODAY*

MATHEMATICAL METHODS for DIGITAL COMPUTERS

VOLUME 1

Edited by ANTHONY RALSTON and HERBERT S. WILF

Treating the subject of numerical analysis from the standpoint of the digital computer, this book offers mathematical analyses of digital computer methods and detailed descriptions of the actual processing of complex mathematical and physical problems.

Twenty-six important and representative problems, drawn from all branches of mathematics, are presented. For each of these problems the reader is led, step-by-step, through the problem analysis, program planning, flow chart construction, and "debugging" stages.

Each chapter represents the contribution of a man in close contact with developments in his field. All of the chapters—with the exception of chapter 1—follow the same format, giving the function of the program, mathematical discussion of the given problem, calculation procedures, the flow chart, a description of the flow chart, a sample problem, memory requirements, estimate of the running time, and a list of references. Information on Monte Carlo techniques is also included.

Contents

INTRODUCTION

Generation of Elementary Functions. Generation of Elementary Functions—E. G. KOGBELIANTZ, *International Business Machines Corporation and the Rockefeller Institute for Medical Research.*

Matrices and Linear Equations. Matrix Inversion and Related Topics by Direct Methods—ALEX ORDEN, *University of Chicago.* The Solution of Linear Equations by the Gauss-Seidel Method—R. VAN NORTON, *New York University.* The Solution of Linear Equations by the Conjugate-Gradient Method—F. S. BECKMAN, *International Business Machines Corporation.* Matrix Inversion by the Method of Rank Annihilation—HERBERT S. WILF, *The University of Pennsylvania.* Matrix Inversion by Monte Carlo Methods—FLORENCE JEANNE OSWALD, *Nuclear Development Corporation of America.* The Determination of the Characteristic Roots of a Matrix by the Jacobi Method—JOHN GREENSTADT, *International Business Machines Corporation.*

Ordinary Differential Equations. Numerical Integration Methods for the Solution of Ordinary Differential Equations—ANTHONY RALSTON, *State University of New York at Buffalo.* Runge-Kutta Methods for the Solution of Ordinary Differential Equations—MICHAEL J. ROMANELLI, *Ballistic Research Laboratories.* The Numerical Solution of Boundary Value Problems—EUGENE L. WACHSPRESS, *Knolls Atomic Power Laboratory.* The Solution of Ordinary Differential Equations with Large Time Constants—J. CERTAINE, *Nuclear Development Corporation of America.*

Partial Differential Equations. The Numerical Solution of Parabolic Partial Differential Equations—HERBERT P. KELLER, *New York University.* Iterative Methods for the Solution of Elliptic Partial Differential Equations—J. W. SHELDON, *Computer Usage Company, Inc.* A Monte Carlo Method for the Solution of Elliptic Partial Differential Equations—CARL N. KLAHR, *Technical Research Group.* The Numerical Solution of Hyperbolic Partial Differential Equations by the Method of Characteristics—MARY LISTER, *The Pennsylvania State University.* The Solution of Hyperbolic Partial Differential Equations by Difference Methods—P. FOX, *Massachusetts Institute of Technology.*

Statistics. Multiple Regression Analysis—M. A. EFROMSON, *Esso Research and Engineering Company.* Factor Analysis—HARRY H. HARMAN, *Systems Development Corporation.* Autocorrelation and Spectral Analysis—RAYMOND W. SOUTHWORTH, *Yale University.* Analysis of Variance—H. O. HARTLEY, *Iowa State College.*

Miscellaneous Methods. The Numerical Solution of Polynomial Equations—HERBERT S. WILF, *The University of Pennsylvania.* Methods for Numerical Quadrature—ANTHONY RALSTON, *State University of New York at Buffalo.* Multiple Quadrature by Monte Carlo Methods—HERMAN KAHN, *The Rand Corporation.* Fourier Analysis—G. GOERTZEL, *Nuclear Development Corporation of America.* The Solution of Linear Programming Problems—DEAN N. ARDEN, *Massachusetts Institute of Technology.* Network Analysis—T. R. BASHKOW, *Columbia University.*

1960. 293 pages. \$9.95.

Order from your bookseller—or order direct from Wiley by asking for F 70686 Ralston: *Computers, Vol. 1.*

THRESHOLD LOGIC

By P. M. LEWIS II, *General Electric Research and Development Center; and*
C. L. COATES, *University of Texas.*

This book presents a complete exposition of Threshold Logic with emphasis on synthesis for prescribed sensitivity constraints. It contains a unified presentation of both the single- and multi-gate cases. Sensitivity constraints are carefully studied and appear as parameters in most synthesis procedures.

The book is directed to both the engineer interested in designing circuits and the student or researcher interested in the detailed theory. For the circuit designer, about one hundred illustrative examples demonstrate the use of the synthesis procedures and give a "physical feel" for the theory so that many circuits can be designed without the detailed procedures. For the student and researcher, the book also contains a complete exposition of the theory including many previously unpublished results. The entire theory is presented in an integrated fashion using the function tree as a unifying concept.

Contents

INTRODUCTORY CONCEPTS. Definition of the Threshold Gate. Advantages of Threshold Logic. Threshold or Linearly Separable Functions. T-Gate Realizations of Special Functions. Threshold Gate Circuits. Threshold Gate Sensitivity Models. Sensitivity: Definite Zero-One Model. Sensitivity: Definite Minus-Plus-One Model. Characterization of Linear Separability by Simultaneous Inequalities. **ELEMENTARY PROPERTIES.** Introduction. Simple T-Gate Realization of Logical Functions. Equivalent T-Gate Realizations. T-Gate Realizations of Complement Functions. The Complementing Symmetry Class of Functions. Dual Switching Functions. T-Gate Network Analysis: An Example. **REDUCED FUNCTIONS.** Introduction. Unate Functions and Coefficient Signs. Properties of Unate Functions. Reduced Functions and Coefficient Ordering. A Coefficient Ordering Procedure—Variable Size. The Largest and the Smallest Coefficients. 2-Monotonicity. General Monotonicity. Monotonicities and the Simultaneous Inequalities. Asummability. Reduced Functions in T-Gate Networks. **THE FUNCTION TREE.** Introduction. Properties of Descendants of Linearly Separable Functions. Descendant Pair Ranges for Linearly Separable Functions. General Range Theorems for Linearly Separable Functions. The Function Tree and Simultaneous Inequalities for l s. Functions. The Incomplete Tree and the MSP Forms of F and F . The Tree for l s. Functions with Symmetric Variables. Reduced Trees for Linearly Separable Functions and Reduced Sets of Inequalities. Range Theorems and Function Trees for Arbitrary Switching Functions. The Function Tree for Functions with Don't-Care Points. **REALIZATION PROCEDURES USING THE FUNCTION TREE.** Introduction. Single-Gate Procedure: General Description. Single-Gate Procedure: Preliminary Considerations. Single-Gate Procedure: Step-By-Step Description. Single-Gate Procedure: Void Common Range. Multigate Procedure: Preliminary Considerations. Starting the Procedure. **THREE-INPUT MAJORITY GATES**

AND SYMMETRIC FUNCTIONS. Introduction. Simple Realizations. Simplification Methods. Realization Procedures: Single Pass. Realization Procedure: Two-Pass. Two-Pass Realization Procedure: Step-by-Step Description. M_3 -Gate Canonic Realizations of Symmetric Functions. Canonic T-Gate Networks for Symmetric Function Realizations. Canonic T-Gate Realizations for the Parity Functions. Another Bound on the Number of Required T Gates. Summary. Synthesis of Symmetric Functions. **DUALITY AND RELATED T-GATE REALIZATIONS.** Introduction. Properties of Dual Comparable and Self-Dual Functions. Self-Dual Representative Functions. The Tree-Method Realization of Self-Dual Functions. Self-Dual Realizations Based on the Form $F_a + F_a^d \Phi_0$. Self-Dual Realizations Based on the Form $M(\Phi_a, \Phi_b, y)$. **ADVANCED TREE OPERATIONS — A TEST FOR LINEAR SEPARABILITY.** Introduction. Linear Separability Test: The Basic Idea. Linear Separability Test: An Informal Description. Linear Separability Test: Formal Description. Maximally Reliable Single-Gate Realizations. **METHODS FOR SOLVING SIMULTANEOUS INEQUALITIES.** Introduction. Formulation of the Problem. Successive-Elimination-of-Variables Method. Linear Programming: The General Idea. Simplex Algorithm: The Basic Idea. Making the Variable Change—Slack Variables. The Tableau. Simplex Algorithm Realizations of T Gates with Maximum Relative Gap. Simplex Algorithm Realizations of T Gates with Minimum. Normalized Fan-In. The Dual Problem and Related Properties. The Dual Solution to the Minimum Normalized Fan-In Problem. Properties Based on Duality. Proof of Theorem 3.17. **ADAPTIVE METHODS.** Introduction. Description of the Single-Gate Adaptive Procedure. Alternative Description of the Single-Gate Adaptive Procedure. Proof of Convergence. Extensions and Modifications of the Procedure. Pattern Recognition Interpretation. Evaluation of Adaptive Procedure. Point Counting Methods.

APPENDICES

BIBLIOGRAPHY

INDEX

1967. 483 pages. \$15.00.

Order from your bookseller—or order direct from Wiley by asking for F 53250 Lewis: Logic.

For the latest on information processing —

NON-LINEAR PROGRAMMING

Edited by J. ABADIE, Electricité de France, Paris.

Non-Linear Programming is concerned with the problem of maximizing a function subject to inequality and equality constraints, in the case where the function is not linear or the constraint set is not a polyhedron. This volume contains lectures delivered before an international group of scientists. The lectures are self-contained and can serve either to supplement a regular one-semester course on Mathematical Programming or as an original reference book for everyone. *A North-Holland (Interscience) book.*

Contents

Non-Linear Programming and Duality (S. VAJDA). On the Kuhn-Tucker Theorem (J. M. ABADIE). On a Pair of Dual Non-Linear Programs (H. W. KUHN). Positive (semi-) Definite Programming (G. B. DANTZIG and R. W. COTTLE). Some Applications of the Conjugate Function Theory to Duality (A. WHINSTON). Methods of Non-Linear Programming (P. WOLFE). Numerical Methods (E. M. L. BEALE). Resolution of Mathematical Programming with Non-Linear Constraints by the Method of Centres (P. HUARD). Some General Methods in Integer Programming (M. L. BALINSKI). A Study of Some Inequalities for Non-Linear Stochastic Programming (BUI TRONG LIEU). One-sided Constraints in Hydrodynamics (J. J. MOREAU). Application of Generalized Linear Programming to Control Theory (G. B. DANTZIG). Optimal Control and Convex Programming (J. B. ROSEN).

1967. 316 pages. \$13.00.

Order from your bookseller—or order direct from Wiley by asking for M 00025 Abadie: Programming.

JOHN WILEY & SONS, INC. 

605 Third Avenue, New York, N. Y. 10016

PLEASE SEND the following books on 10 days' approval. I agree to pay for the books, plus a few cents' postage and handling, or return them postpaid, in good condition, within 10 days of receipt. (Wiley pays postage on orders accompanied by remittance.)



Print the names of the books you want:

(Author)

(Title)

BILL TO:

Firm

Name

Address

City

Zip

State

SHIP TO (*If same as BILL TO, write SAME*)

Firm

Name

Address

City

Zip

State

Professional books are tax deductible.

☐ Payment enclosed